AMENDMENTS TO THE CLAIMS

1-57. (Canceled)

58. (Currently Amended) A converging element which converges a first light beam from a first light source onto ~~each of at least two types of~~ a first optical information recording ~~media~~ medium ~~of thickness different between them and made of~~ having a transparent plate, and converges a second light beam from a second light source onto a second optical information medium having a second transparent plate thicker than the first optical information recording medium, said converging element having an inner region near a center axis of the first and second light ~~beam~~ beams and an outer region far from the center axis, said outer region having a plane optimized to converge the first light beam transmitting said outer region onto ~~a~~ the first optical information recording medium ~~among the optical information recording media~~, said inner region having a plane optimized to converge the second light beam transmitting said inner region onto ~~another optical~~ the second information recording medium having a larger thickness than the first ~~one~~ information recording medium, wherein a phase of the light beam transmitting an innermost portion in the plane of said outer region is shifted relative to that of the light beam transmitting an outermost portion in the plane of said inner region, said converging element comprising:

~~wherein said element comprises~~ a lens which converges the first light beam onto the first optical information recording medium and the second light beam ~~from the light source~~ onto ~~an~~ the second optical information recording medium; and

an optical plate element to be cooperated ~~therewith~~ with said lens;

wherein said lens comprises a first inner subregion near a center axis of the first and second light ~~beam~~ beams and a first outer subregion far from the center axis, said first outer subregion ~~far~~ having a plane optimized to converge the first light beam transmitting said first outer subregion onto the first optical information recording medium, said first inner subregion having a plane optimized to converge the second light beam transmitting said first inner subregion onto the ~~another~~ second optical information recording medium having a larger thickness than the first optical information recording medium;

wherein said optical plate element comprises a second inner subregion and a second outer subregion divided from the second inner subregion with an optical step;

wherein said second inner subregion and said second outer subregion are arranged such that the first light beam transmitting said first outer subregion transmits said second outer subregion while the second light beam transmitting said first inner subregion transmits said second inner subregion;

wherein said inner region comprises said first inner subregion and said second inner subregion, and said outer region comprises said first outer subregion and said second outer subregion.

59. (Previously Presented) The converging element according to claim 58, wherein said second inner subregion of said optical plate element is made of a dielectric material different from that of said second outer subregion.

60. (Currently Amended) The converging element according to claim 58, wherein a thickness of said second inner subregion of said optical plate element is different from ~~that~~ a thickness of said second outer subregion thereof.

61. (Previously Presented) The converging element according to claim 60, wherein the thickness of said second inner subregion is constant.

62. (Currently Amended) The converging element according to claim 60, wherein said second inner subregion has a plane optimized to converge the first and second light beams ~~beam~~ transmitting therethrough.

63. (Currently Amended) An optical head comprising:

a first light source for generating a first light beam;

a second light source for generating a second light beam;

a converging element which converges ~~a~~ the first light beam ~~from said light source~~ onto ~~each of at least two types of~~ a first optical information recording medium having a transparent plate, and converges the second light beam onto a second optical information recording medium having a transparent plate thicker than the first optical information recording medium ~~media of thickness different between them and made of a transparent plate~~, said converging element having an inner region near a center axis of the first and second light ~~beam~~ beams and an outer

region far from the center axis, said outer region having a plane optimized to converge the first light beam transmitting said outer region onto ~~a~~ the first optical information recording medium ~~among the optical information recording media~~, said inner region having a plane optimized to converge the second light beam transmitting said inner region onto ~~another~~ the second optical information recording medium having a larger thickness than the first ~~one~~ optical information recording medium, wherein a phase of the light beam transmitting an innermost portion in the plane of said outer region is shifted relative to that of the light beam transmitting an outermost portion in the plane of said inner region, wherein said converging element comprises:

~~wherein said element comprises~~ a lens which converges the first light beam ~~from the light source~~ onto ~~an~~ the first optical information recording medium and the second light beam onto the second optical information recording medium; and

an optical plate element to be cooperated ~~therewith~~ with said lens;

wherein said lens comprises an inner region near a center axis of the first and second light ~~beam~~ beams and an outer region far from the center axis, said outer region having ~~the~~ a plane optimized to converge the first light beam transmitting said outer region onto the first optical information recording medium, said inner region having ~~the~~ a plane optimized to converge the second light beam transmitting said inner region onto the ~~another~~ second optical information recording medium having a larger thickness than the first ~~one~~ optical information recording medium;

wherein said optical plate element comprises an inner portion and an outer portion divided from the inner portion with an optical step,

wherein said inner and outer portions are arranged in cooperation with said lens such that the first light beam transmitting said outer region of said lens transmits said outer portion and the second light beam transmitting said inner region of said lens transmits said inner portion.

64. (Currently Amended) The optical head according to claim 63,

wherein ~~said~~ the first light beam ~~source generates light beams of two wavelengths~~ has a first wavelength, and the second light beam has a second wavelength different than the first wavelength, and

wherein said lens has a plane in said outer region optimized to converge the light beam of [[a]] the first wavelength ~~in the two wavelengths~~ transmitting said outer region onto the first optical information recording medium and has another plane in said inner region optimized to converge the light beam of [[a]] the second wavelength ~~different from the first one~~ transmitting said inner region onto the ~~another~~ second optical information recording medium having a larger thickness than the first ~~one~~ information recording medium when said lens is ~~cooperated~~ used along with said optical plate element.

65. (Currently Amended) The optical head according to claim 63,

wherein said optical plate element and said lens are held by a movable member having a driver means which moves ~~it~~ in focus and tracking directions for said lens, and

wherein said optical plate element and said lens are arranged to keep dynamical balance relative to a center of gravity of said movable member.

66. (Currently Amended) The optical head according to claim 64,

wherein said optical plate element and said lens are held by a movable member having a driver means which moves ~~it~~ in focus and tracking directions for said lens, and

wherein said optical plate element and said lens are arranged to keep dynamical balance relative to a center of gravity of said movable member.

67. (Currently Amended) The optical head according to claim 66, wherein ~~said light source generates light beams of two wavelengths, and~~ said lens has the plane in said inner region optimized to converge the light beam of a second wavelength ~~different from a first one generated by said light source and~~ transmitting said inner region onto the ~~another~~ second optical information recording medium having a larger thickness than the first ~~one~~ information recording medium.

68. (Currently Amended) An optical information recording and reproducing apparatus comprising:

a first light source which generates a first light beam;

a second light source for generating a second light beam;

a converging element which converges ~~a~~ the first light beam from ~~said light source~~ onto ~~each of at least two types of~~ a first optical information recording medium having a transparent plate, and converges the second light beam onto a second optical information recording medium having a transparent plate thicker than the first optical information recording medium ~~media of different thicknesses and made of a transparent plate~~;

a first photodetector and a second photodetector which ~~receives a~~ receive light reflected from ~~the each of~~ the first and second optical information recording ~~media~~ mediums, respectively, to convert ~~it~~ the reflected light to an electric signal; and

a signal processor which distinguishes ~~the~~ a type of optical information recording medium and reads information selectively from the electric signal;

wherein said converging element comprises an inner region near a center axis of the first and second light ~~beam~~ beams and an outer region far from the center axis, said outer region having a plane optimized to converge the first light beam transmitting said outer region onto a first optical information recording medium ~~among the optical information recording media~~, said inner region having a plane optimized to converge the second light beam transmitting said inner region onto ~~another~~ the second optical information recording medium having a larger thickness than the first ~~one~~ optical information recording medium, and a phase of the light beam transmitting an innermost portion in the plane of said outer region is shifted relative to that of the light beam transmitting an outermost portion of the plane of said inner region,

wherein said converging element comprises:

a lens which converges the first light beam ~~from the light source~~ onto ~~an~~ a first optical information recording medium and the second light beam onto th second optical information recording medium; and

an optical plate element to be cooperated ~~therewith~~ with said lens;

wherein said lens comprises a first inner portion near a center axis of the first and second light ~~beam~~ beams and a first outer portion far from the center axis, said first outer portion having a plane optimized to converge the first light beam transmitting said first outer portion onto the first optical information recording medium, said first inner portion having a plane optimized to converge the second light beam transmitting said first inner portion onto the ~~another~~ second optical information recording medium having a larger thickness than the first ~~one~~ optical information recording medium;

wherein said optical plate element comprises a second inner portion and a second outer portion divided from the second inner portion with an optical step,

wherein said second inner and outer portions are arranged such that the first light beam transmitting said first outer portion transmits said second outer portion while the second light beam transmitting said first inner portion transmits said second inner portion when said optical plate element is cooperated with said lens.

69. (Currently Amended) The apparatus according to claim 68,

wherein said optical plate element and said lens are held by a movable member having a driver means which moves ~~it~~ in focus and tracking. directions for said lens, and

wherein said optical plate element and said lens are arranged to keep dynamical balance relative to a center of gravity of said movable member.

70. (Currently Amended) The apparatus according to claim 68, wherein when the first light beam is converged onto the first optical information recording medium, ~~and~~ a wave-front aberration satisfies the condition that

a total amount of aberration ≥ 20 mλ (rms),

and

a fifth spherical aberration ≤ 20 mλ (rms).

71. (Currently Amended) The apparatus according to claim 70, wherein when the first light beam is converged onto the first optical information recording medium, ~~and~~ a wave-front aberration satisfies that the condition that

a seventh spherical aberration ≤ 30 mλ (rms).

72. (Currently Amended) The apparatus according to claim 68, wherein a numerical aperture, NA, of the plane of said inner region and a NA of the entire ~~aperture~~ lens ~~has~~ have a following relationship that

0.7 * NA of the entire ~~aperture~~ lens ≤ NA of said inner region ≤ 0.8 * NA of the entire ~~aperture~~ lens, and a phase shift of the light beam transmitting the innermost portion of the

plane of said outer region to that of the light beam transmitting the outermost portion of the plane of said inner region has a value between 50 and 150 degrees.

73. (Currently Amended) The apparatus according to claim 68, wherein said converging element is optimized to converge the light beam onto an information recording medium having a thickness of the inner region equal to or smaller than t1*0.6 wherein t1 denotes thickness of a plane of ~~a~~ the second information recording medium ~~among the optical information recording media~~.

74. (Currently Amended) The apparatus according to claim 68, wherein said first and second photodetectors ~~photodetector is~~ are provided for ~~each of~~ the first and second optical recording information ~~media~~ mediums of different thicknesses.

75. (New) A converging element which converges a first light beam from a first light source used for recording and/or reproduction for a first optical information recording medium having a first transparent plate, and converges a second light beam from a second light source used for recording and/or reproduction for a second optical information recording medium having a second transparent plate thicker than the first optical information recording medium, the converging element comprising:

a lens which converges the first light beam onto the first optical information medium and converges the second light beam onto the second optical information medium; and

an optical plate element to be combined with said lens;

wherein said lens comprises a first inner region near a center axis of the first and second light beams and a first outer region far from the center axis and adjacent to said first inner region;

wherein said optical plate element comprises a second inner region and a second outer region separated from each other by an optical step;

wherein when the first light beam enters the second inner region and the second outer region of said optical plate element and the first inner region and the first outer region of said lens to be focused onto a recording layer formed on the first transparent plate of the first information recording medium, the first beam is converged on the recording layer such that spherical aberration of the first light beam transmitting the first outer region becomes minimum for the thickness of the first optical information recording medium; and

wherein when the second light beam enters the second inner region of said optical plate element and the first inner region of said lens to be focused onto a recording layer formed on said second transparent plate, the second beam is converged on the recording layer such that spherical aberration of the second light beam transmitting the first and second inner regions becomes minimum for a transparent plate having a thickness between the thickness of the first optical information recording medium and the thickness of the second optical information recording medium.

76. (New) The converging element according to claim 75, wherein a thickness of said optical plate element is different between the second inner region and the second outer region.

77. (New) The converging element according to claim 75, wherein the second inner region and the second outer region of said optical plate element are made of dielectric materials different from each other.

78. (New) An optical head comprising:

a first light source which generates a first light beam used for recording and/or reproduction for a first optical information recording medium having a first transparent plate;

a second light source which generates a second light beam used for recording and/or reproduction for a second optical information recording medium having a second transparent plate thicker than the first optical information recording medium; and

a converging element which converges the first light beam from said first light source onto the first optical information recording medium and converges the second light beam from said second light source onto the second optical information recording medium;

said converging element comprising:

a lens which converges the first light beam onto the first optical information medium and converges the second light beam onto the second optical information medium; and

an optical plate element to be combined with said lens;

wherein said lens comprises a first inner region near a center axis of the first and second light beams and a first outer region far from the center axis and adjacent to said first inner region;

wherein said optical plate element comprises a second inner region and a second outer region separated from each other by an optical step;

wherein when the first light beam enters the second inner region and the second outer region of said optical plate element and the first inner region and the first outer region of said lens to be focused onto a recording layer formed on the first transparent plate of the first information recording medium, the first beam is converged on the recording layer such that spherical aberration of the first light beam transmitting the first outer region becomes minimum for the thickness of the first optical information recording medium; and

wherein when the second light beam enters the second inner region of said optical plate element and the first inner region of said lens to be focused onto a recording layer formed on said second transparent plate, the second beam is converged on the recording layer such that spherical aberration of the second light beam transmitting the first and second inner regions becomes minimum for a transparent plate having a thickness between the thickness of the first optical information recording medium and the thickness of the second optical information recording medium.

79. (New) The optical head according to claim 78, wherein a thickness of said optical plate element is different between the second inner region and the second outer region.

80. (New) The optical head according to claim 78, wherein the second inner region and the second outer region of said optical plate element are made of dielectric materials different from each other.

81. (New) An optical information recording and reproducing apparatus comprising:

a first light source which generates a first light beam used for recording and/or reproduction for a first optical information recording medium having a first transparent plate;

a second light source which generates a second light beam used for recording and/or reproduction for a second optical information recording medium having a second transparent plate thicker than the first optical information recording medium;

a converging element which converges the first light beam from said first light source onto the first optical information recording medium and converges the second light beam from said second light source onto the second optical information recording medium;

a first photodetector and a second photodetector which receive light reflected from the first and second optical information recording mediums, respectively, to convert the reflected light to an electric signal; and

a signal processor which distinguishes a type of optical information recording medium and reads information selectively from the electric signal;

said converging element comprising:

a lens which converges the first light beam onto the first optical information medium and converges the second light beam onto the second optical information medium; and

an optical plate element to be combined with said lens;

wherein said lens comprises a first inner region near a center axis of the first and second light beams and a first outer region far from the center axis and adjacent to said first inner region;

wherein said optical plate element comprises a second inner region and a second outer region separated from each other by an optical step;

wherein when the first light beam enters the second inner region and the second outer region of said optical plate element and the first inner region and the first outer region of said lens to be focused onto a recording layer formed on the first transparent plate of the first information recording medium, the first beam is converged on the recording layer such that spherical aberration of the first light beam transmitting the first outer region becomes minimum for the thickness of the first optical information recording medium; and

wherein when the second light beam enters the second inner region of said optical plate element and the first inner region of said lens to be focused onto a recording layer formed on said second transparent plate, the second beam is converged on the recording layer such that spherical aberration of the second light beam transmitting the first and second inner regions becomes minimum for a transparent plate having a thickness between the thickness of the first optical information recording medium and the thickness of the second optical information recording medium.

82. (New) The optical information recording and reproducing apparatus according to claim 81, wherein said optical plate element has a thickness different between the second inner region and the second outer region.

83. (New) The optical information recording and reproducing apparatus according to claim 81, wherein the second inner region and the second outer region of said optical plate element are made of dielectric materials different from each other.